

I CLAIM AS MY INVENTION:

1. A method for adaptively triggering respiration phases in a breathing device, comprising the steps of:

determining a first respiration indicator signal in a breathing gas circuit based on at least one parameter selected from the group consisting of flow and pressure in said breathing gas circuit;

comparing said first respiration indicator signal with a trigger requirement;

generating a trigger signal to trigger a respiratory phase when said first respiration indicator signal satisfies said trigger requirement;

measuring an excitable cell signal related to respiration in a patient participating in said breathing gas circuit;

determining a second respiration indicator signal based on the measured excitable cell signal; and

adapting said trigger requirement dependent on said second respiration indicator signal.

2. A method as claimed in claim 1 wherein said trigger requirement is trigger sensitivity, and wherein the step of adapting said trigger requirement comprises increasing said trigger sensitivity relative to said first respiration indicator signal when said second respiration indicator signal indicates commencement of a natural change of respiratory phase.

3. A method as claimed in claim 1 wherein said trigger requirement is trigger enablement, and wherein the step of adapting the trigger requirement comprises enabling triggering only when said second respiration indicator signal indicates commencement of a natural change of respiratory phase.

4. A method as claimed in claim 1 wherein the step of measuring an excitable cell signal comprises measuring a phrenic efferent discharge.

5. A method as claimed in claim 1 wherein the step of measuring an excitable cell signal comprises measuring a muscle signal.

6. A method as claimed in claim 5 wherein the step of measuring a muscle cell signal comprises measuring a diaphragm electromyography signal.

7. A method as claimed in claim 1 wherein the step of determining a first respiration indicator signal comprises determining said first respiration signal based on only one of said parameters selected from the group consisting of flow and pressure, and comprising the additional steps of:

determining a third respiration indicator signal based on the other of the parameter selected from the group consisting of flow and pressure; and additionally adapting said trigger requirement dependent on said third respiration indicator signal.

8. A breathing device comprising:

a tubing system adapted for communication with a subject;

a pneumatic unit in communication with said tubing system for regulating a flow of breathing gas in said tubing system;

a sensor system in communication with said tubing system including at least one meter selected from the group consisting of a flow meter for measuring flow of said breathing gas in said tubing system and a pressure meter for measuring a pressure of said breathing gas in said tubing system;

a control unit connected to said pneumatic unit for controlling said pneumatic unit, said control unit comprising a first determination unit connected to

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said sensor system for receiving a measurement signal from said measurement system representing said at least one parameter and for determining a first respiration indication signal based on said at least one parameter, a comparator connected to said first determination unit and receiving said first respiration indication signal therefrom and comparing said first respiration indication signal with a trigger requirement, said comparator generating a comparator output dependent on whether said trigger requirement is satisfied by said first respiration indication signal, and a signal generator supplied with said comparator output which generates a trigger signal for controlling triggering of respiratory phases dependent on said comparator output;

an excitable cell detector adapted for detecting excitable cell signals related to respiration by said subject;

a second determination unit supplied with said excitable cell signals which determines a second respiration indicator signal based on said excitable cell signals; and

an adaptation unit supplied with said second respiration indicator and connected to said comparator, said adaptation unit adapting said trigger requirement dependent on said second respiration indicator signal and supplying said trigger requirement to said comparator.

9. A breathing device as claimed in claim 8 wherein said trigger requirement is trigger sensitivity, and wherein said adaption unit increases the trigger sensitivity relative to said first respiration indicator signal when said second respiration indicator signal indicates commencement of a natural change of respiratory phase.

10. A breathing device as claimed in claim 8 wherein said trigger requirement is trigger enablement, and wherein said adaptation unit adapts said trigger requirement to enable triggering only when said second respiration indicator signal indicates commencement of a natural change of respiratory phase.

11. A breathing device as claimed in claim 8 wherein said excitable cell signal detector comprises a nerve signal sensor.

12. A breathing device as claimed in claim 11 wherein said nerve signal sensor comprises a phrenic efferent signal sensor.

13. A breathing device as claimed in claim 8 wherein said excitable cell signal detector comprises a muscle signal sensor.

14. A breathing device as claimed in claim 13 wherein said muscle signal sensor comprises a diaphragm electromyography sensor.

15. A breathing device as claimed in claim 14 wherein said diaphragm electromyography sensor comprises an esophageal catheter having an array of sensing electrodes.